ON CERTAIN GENERA AND FAMILIES OF ZOOPHAGOUS GASTEROPODS.

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Fam. CYSTISCIDÆ.

The characters of the soft parts, in the the new genus described below, seem to warrant the establishment of a distinct family for its reception, notwithstanding the great similarity to the Marginellidæ shown in the shell and lingual dentition.

CYSTISCUS, nov. gen.—pl. 8, f. 2.

Shell (plate 6, fig. 2, *a*, *b*,) resembling that of some *Marginellæ* or *Persiculæ*, small, thin, ovate, inflated, smooth and polished; spire very short, but distinct; suture not impressed, but filled up with a glossy deposit of shelly matter; aperture narrow; columella with plaits on the anterior half. Foot (fig. 2. *d*,) elongated, narrower than the shell, and truncated in front; head oblong, depressed, bifurcated in front to form the short, triangular, flattened and horizontal tentacles; eyes at the lateral margins of the head, a little behind the bases of the tentacles; mentum as broad as the head, but not extending beyond the tips of the tentacles. Teeth of the lingual ribobn (fig. 2. *c*,) in a single row, 0· 1· 0, and resembling in form the rhachidian teeth of the Muricidæ*, thick and strong, with seven unequal, conical denticles† on its upper surface, of which the central, and two outer ones on either side are large, and project slightly beyond the anterior margin.

In the examination of the living animal, it was unfortunately not determined whether the shell is covered externally by an expansion of the mantle as in the Marginellidæ, but this is probably the case, judging by the character of the surface of the shell and the filling up of the suture. This pallial envelope, if existing, must be very thin and delicate, and not ornamented with tubercles or fringes, otherwise it would not have easily escaped observation. The form of the respiratory siphon also remains to be ascertained.

CYTISCUS CAPENSIS, sp. unica, nov. (plate 8, fig. 2,)

Shell four-whorled, white, translucent; the contained bluish viscera showing through in living examples. Columella with

* As restricted further on, to *Murex*, *Trophon*, etc.

† There were eight denticles in the specimen figured, producing a want of symmetry doubtless merely accidental.

four-folds beside that forming its basal extremity or truncation. Foot lemon yellow; eyes minute, dark reddish.

Length of the shell 0·14; width about 0·10 inch.

Found on Gorgoniæ dredged by the writer from a rocky bottom in 20 fathoms, in False Bay, Cape of Good Hope, North Pacific Expl. Expedition, Com. C. Ringgold, U. S. N., Commanding.

Fam. MURICIDÆ.

This group has been used with several very different limitations by recent malacological writers, and requires careful revision, toward which we have some suggestions to offer.

Woodward* includes in the family the genera *Murex*, *Typhis*, *Pisania*, *Ranella*, *Triton*, *Fasciolaria*, *Turbinella*, *Cancellaria*, *Trichotropis* and *Fusus* (= *Colus*.) H. & A. Adams† include *Murex*, and its recent subdivisions (*Chicoreus*, *Phyllonotus*, *Vitularia*, *Ocinebra*, *Muricidea*, etc.,) *Trophon*, *Fusus* (= *Colus*,) *Neptunea*, *Clavella*, *Pisania*, *Metula*, *Cassidulus*, *Hemifusus*, *Cantharus* (= *Pollia*,) *Tritonidea* and *Euthria*. Gray‡ assigns to the family his groups, Muricina, Colusina, Pisaniana, (including *Columbella* and *Engina*,) Cominellina, Nassina and Phosina. Carpenter§ restricts it to the genera *Murex* and its allies, *Trophon*, *Fusus* (= *Colus*,) *Chrysodomus* (= *Neptunea*,) *Clavella*, *Pisania*, *Engina*, *Cominella*, *Metula* and *Anachis*.

We thus have representatives of ten families (Muricidæ, Buccinidæ, Cassidulidæ, Nassidæ, Columbellidæ, Fasciolariidæ, Turbinellidæ, Trichotropidæ, Cancellariidæ and Tritonidæ,) and of three distinct suborders, (Hamiglossata, Toxoglossata and Taenioglossata,) referred to the Muricidæ by one or other of the different authors quoted.

From this long list we will proceed to eliminate as follows:—The reference by Woodward of the Taenioglossate *Ranella Triton*, *Trichotropis* and *Pyrula* (= *Ficula*, Sw.,) and of the Toxoglossate *Cancellaria* to the group is not surprising, since the importance of the characters of the lingual dentition in classification was not generally understood at the time when the first part of that author's excellent and comprehensive work was published. The same remark will apply to the Odontoglossate *Fasciolaria* and *Turbinella*, which have been since referred to their proper place by H. & A. Adams, Gray and Carpenter.

But the family, as understood by these three authors, re-

* Manual of the Mollusca, 1851, p. 106.

† Genera of Recent Mollusca, I., 1853, p. 70.

‡ Guide to the Syst. Distr. of Mollusca, 1856, p. 11.

§ Lectures on Mollusca, 1861, p. 27.

quires still further reduction. *Colus*, as we have recently determined by the examination of the teeth of a species allied to the type, *Fusus colus* Lam., belongs to the Fasciolariidæ, *Bullia*, *Nassa*, *Phos*, and their allies, included in the group by Gray, have been very properly separated by H. & A. Adams and Carpenter. *Cassidulus* and its allies, included by H. & A. Adams, is properly separated by Gray and Carpenter. Certain Columbellidæ included by Gray and Carpenter, are properly separated by H. & A. Adams. The Columbellidæ have, in their unarmed rhachidian and claw-shaped lateral teeth, a peculiar and singularly constant type of lingual dentition*, which forbids the dismemberment of the group on account of differences in the shape of their opercula.

We have then remaining to the family the genera *Murex*, *Typhis*, *Trophon*, *Neptunea*, *Strombella*, *Clavella*, *Pisania*, *Pollia*, *Tritonidea*, *Engina*, *Metula* and *Euthria*, none of which have been referred to any other family by the most recent scientific authors. Among these, however, we find two distinct types of lingual dentition.

1. In *Murex* and the two genera following, the lingual ribbon (plate 8, fig. 3,) is very small; the rhachidian tooth is thick and solid, somewhat like a section of a prism, with the denticles projecting from the anterior edge of the convexity of the upper surface; while the lateral teeth are always simple, with but a single dentiform lobe arising from the base of attachment.

2. In *Neptunea* and the six genera following, the lingual ribbon (plate 8, fig. 4,) is much larger and broader in proportion; the rhachidian tooth is flat and lamelliform, with denticles arising directly from the anterior margin; while the lateral teeth are each armed with at *least* two strong dentiform lobes. This dentition closely resembles that of the Buccinidæ.

There is thus a far greater difference between the dentition of the *Murex*-group, and of the *Neptunea*-group than between that of this latter group and that of the Buccinidæ. We therefore propose to restrict the limits of the family Muricidæ to the genus *Murex* and its allies, and to place the *Neptuneæ*, etc., in the family Buccinidæ as a sub-family Neptuniinæ.

The dentition of *Metula* and *Euthria* is as yet unknown, so that their true place remains uncertain.

After so wholesale a depauperization of the family Muricidæ, we can do no less than endeavor to make amends by seeking for the genera which, though properly belonging to it, may have been wrongly placed in other families.

*See Moerch's investigations upon the lingual teeth of the Columbellidæ. Journal de Conchyliologie, VII., 1858, p. 254.

As a commencement of this portion of the work, we may mention the group of shells of which the *Ranella caudata* of Say, and the *R. muriciformis* of Broderip are examples, which was named *Eupleura* by H. & A. Adams,* as a subgenus of *Bursa* (*Ranella*). This group, which forms a good genus, proves to be nearly allied to *Ocinebra*. We add a figure of the lingual dentition of *E. caudata*. (plate 8, fig. 5.)

To the Muricidæ we have also the following genus to add, which appears to have as yet received no name.

UROSALPINX,† nov. gen.

Type, U. CINEREA.

Fusus cinereus Say, Amer. Conch., pl. xxix., the two middle figures.

Shell elongated oval, or short fusiform, longitudinally ribbed or undulated and spirally striated; aperture with a short canal. Operculum somewhat like that of *Purpura*, semi-cordate, with the nucleus at the outer edge a little below the middle. Lingual dentition (plate 8, fig. 6) nearly like that of *Trophon*, the lateral teeth having an elongate base of attachment; but the rhachidian tooth has numerous minute denticles between the principal ones, corresponding to ridges on the surface of the tooth, as in the Murices. Ova-capsules (fig. 7) oblong, shouldered, widest near the summit, compressed, carinated on either side, peduncle short; base of attachment very small; aperture median at the summit.‡

It differs from *Trophon* in its operculum, and from *Ocinebra* in its smoother shell, want of varices, and open canal.

* Genera of Recent Mollusca, I., p. 107. It is doubtful whether we are required to adopt the name *Eupleura*, and several others among the names given by H. & A. Adams to groups of shells supposed to be of generic value. For, in the cases referred to, the authors cannot strictly be considered to have given a determinable type or example, which is necessary for the acceptance of a generic name by the scientific world. They indeed give a list of species, with authorities, but without references to descriptions, and with no mention of the genus to which the species was originally referred. For instance, the first species of *Eupleura* mentioned is simply "*caudata*, Say"; but we may search in vain through Say's works for any such name as "*Eupleura caudata*," or even "*Bursa caudata*." Out of courtesy, indeed, many of the names so proposed by H. & A. Adams will be adopted when the genera prove to be good, if collateral knowledge enables us, as in the present instance, to form a tolerably correct surmise as to the type; but it is highly desirable that the typical species should be much more clearly indicated in future.

† Οὐρά, *cauda*; σάλπιγξ, *buccina*.

‡ In the form of the ovacapsules we find an important difference between the Muricidæ and the Buccinidæ. In the former group they are more or less pedunculated and erect, while in the latter they are flattened, discoidal, adhering by the broad flat base, and generally occur piled upon one another in masses.

The typical species has been considered by some as a *Fusus*, on account of the length of the canal, by others as a *Buccinum*, on account of the form of the operculum. It is described by Gould in the "Invertebrata of Massachusetts," under the name of *Buccinum plicosum*. Its dentition proves it to belong to the Muricidæ. It is littoral in its habits and is found on the Eastern coast of the United States, from Maine to Florida.

Fam. PTYCHATRACTIDÆ.

This new group is proposed for the reception of the following genus, which will not fall into any of the Hamiglossate families as yet named. Its dentition resembles that of the Purpuridæ more than that of any other family, but the form of the shell and operculum forbid its approximation to that group.

PTYCHATRACTUS*, nov. gen.

Type, P. LIGATUS.

Fasciolaria ligata Mighels & Adams. Boston Journal Natural History, IV., 1842, p. 51, pl. iv., f. 17.

Shell fusiform, spirally striated; aperture with a rather long canal; columella plicated as in *Fasciolaria*. Operculum like that of *Neptunea*. Lingual teeth, (plate 8, fig. 8,) 1· 1· 1; rhachidian tooth deeply arched, with three strong denticles at the middle of the anterior edge; lateral teeth versatile, greatly elongated, simple, with a swollen base and hook-shaped extremity.

This mollusk, in the character of its lingual dentition, is widely removed from the Fasciolariidæ, in which the lateral teeth are not versatile. The only known species is found in deep water, off the coasts of Maine and Nova Scotia, and has also occurred in the Gulf of St. Lawrence.

Fam. BUCCINIDÆ.

Sub-fam. NEPTUNIINÆ.

Shell more or less beaked. Operculum ovate, nucleus apicial.

The *Neptuniæ* and their allies are so very closely allied to the true *Buccina* in their lingual dentition, in the form of the soft parts and of the ovacapsules, and in many other characters, that they should doubtless be arranged in the same family. They may, however, be kept separate from the *Buccinum* group, as a subfamily, on account of the different form of the operculum, the canaliculated aperture of the shell, and the position of the eyes.

* *πτὺξ, plica, ἀτράκτος, fusus.*

To the sub-family Neptuniinæ as separated from the Muricidæ on a previous page, we have to add two genera which have been erroneously placed, hitherto, in widely different groups.

PERISTERNIA Moerch.

The first of these is *Peristernia* of Moerch,* which has been referred to the Turbinellidæ. In this genus, however, the lateral teeth of the lingual ribbon are versatile, and the entire structure of the animal is similar to that of *Neptunea*. We add a figure (plate 9, fig. 9,) of the teeth of a species found on the coast of Georgia.

This case, with that of *Ptychatractus* and *Colus*, will serve to show that by far too much dependence has been placed, in classification, upon the presence or absence of folds upon the columella of the shell.

BUSYCON Bolten.

To the *Neptuniinæ* we have also to refer the genus *Busycon* of Bolten (=*Fulgur*, Montfort.) The systematic position of this genus has been thus far involved in doubt. Dr. Gray places it in the Cassidulidæ.†

Dr. P. P. Carpenter makes the following remarks‡ with regard to this very natural group of large gasteropods, which is confined, geographically, to the eastern shores of America. "Whether it speaks well for the zeal of American Naturalists that these large species, which can be so easily examined, should be abundant in collections as far as the shell is concerned, but as yet undescribed from the living animals, must be for others to determine." And further:—"Whether they have a whelk-like dentition, or whether they are Fasciolariæ with undeveloped plaits, cannot be told till their animals have been dissected."

Having recently had an opportunity of examining the animals in question, we hasten to remove the stigma upon "the zeal of American naturalists," who, unlike their European brethren, are surrounded by such an abundance of new materials, that it is hardly surprising that so much lies uninvestigated at their doors. We cannot do everything at once. Dr. Carpenter's first conjecture is right—the Busycons have a "whelk-like dentition." Pl. 9, fig. 10 represents that of *B. pyrum*. In this species we have a rather narrow rhachidian tooth, armed with three strong denticles, and a 4-den-

* Cat. Yoldi Coll., 1852, p. 99. Type *Turbinella craticulata* Schubert & Wagner; Kiener pl. ix., f. 2.

† Guide, I., p. 11.

‡ Lectures on Mollusca, p. 32.

ticulate lateral tooth. In *B. canaliculatum*, the rhachidian tooth is broader, with three denticles smaller than in *B. pyrum*; lateral tooth 5-denticulate. In *B. carica* the rhachidian is still broader and armed with five denticles in the female and six in the male; lateral tooth 5-denticulate (♀) or 6-denticulate (♂.) In *B. perversum* ♂, rhachidian 5-denticulate, lateral tooth 6-denticulate.

Besides these four species, a few others have been described *B. carica*. The four species may be arranged in two groups as existing on our coast, but these appear to be all varieties of upon the characters of their shells. *B. carica* and *B. perversum* have rather thick and heavy shells, with the shoulder of the whorls armed with strong spines; *B. pyrum* and *B. canaliculatum* have on the contrary thin, canaliculated shells with unarmed whorls and a ciliated epidermis. These differences, taken in connection with those to be noticed in the lingual dentition, might lead us to separate the two groups generically, were it not that in the Miocene formation of our Atlantic slope we find intermediate forms. For instance, the *B. coronatum* of Conrad has the thick shell and prominent conical spines of the first group in conjunction with the spiral canal of the second; *B. carinatum* of the same author has a thin smooth shell, but no spiral canal; and *B. fusiformis* has a thick shell, while the whorls have neither canal nor spines.

Fam. NASSIDÆ.

We regard the *Nassæ* and their allies as forming a family distinct from the Buccinidæ on account of the arched form and very numerous denticles of the rhachidian tooth of the gual ribbon,—a constant character.

ILYANASSA,* nov. gen.

Type, I. OBSOLETA.

Nassa obsoleta; Say, Journal Academy Natural Sciences, Philadelphia, II, 1822, p. 232. *Buccinum obsoletum* Gould, Invert. Massachusetts, 1841, p. 308, f. 210.

Shell reticulated or decussated, rather thick and strong; spire elevated; inner lip smooth; callus moderate. Foot broad, without caudal bifurcation or cirri. Operculum† resembling somewhat that of *Buccinum*, obovate, broadest below; nucleus a little within the margin at the outer side near the base; margin entire, not serrated; lingual teeth (plate 9, fig. 11,) like those of *Nassa*. Ova-capsules (plate 9, fig.

* Etym., ἰλύς, *limus*; ἄνασσα, *regina*.

† The operculum is always herein considered in its natural position when retracted into the aperture of the shell.

12,) rounded, erect, slightly compressed, with the anterior and upper surface covered with facettes formed by reticulating ridges or crests, the angles of which are spinous.

It differs from *Nassa* and *Phos* in the form of the operculum and the want of caudal cirri on the foot. From *Northia* in the shape of the shell, as well as that of the operculum. The typical species is littoral in station, living on mud-flats in bays and harbors, and is found more abundantly than any other gasteropod on the Eastern coasts of the United States of North America.

Fam. CLIONELLIDÆ.

The genus *Clionella* of Gray,* founded on the *Buccinum sinuatum* of Born,=*Pleurotoma buccinoides* Lam,† will form the type of a new family. It has been supposed, from the color of the thick periostraca of the shell, to be a fresh-water genus, and is placed in the Melanopsinæ by recent authors. It is, however, as has been already pointed out,‡ a marine form. We have had opportunities of observing the living animal in specimens dredged from a sandy bottom at the depth of two fathoms, in Simon's Bay, at the Cape of Good Hope, by the United States North Pacific Exploring Expedition. The soft parts do not accord with the figure of the type given in H. & A. Adams' "Genera," pl. xxii., f. 10.§

In our specimens the eyes are placed near the tips of the tentacles; the foot is short and very broad, projecting anteriorly but little beyond the head, and broadly rounded behind. The operculum is subelliptical, with the nucleus near the middle of the inner side,—resembling that of *Clavatula*, as figured by H. &. A. Adams, and that of *Tomella*, as figured by Gray.‖

The lingual dentition is of a very peculiar type, differing from any yet described (plate 9, fig. 13.) The animal has a true lingual ribbon, with the teeth in three rows 1·1·1: the rhachidian tooth being very small and delicate, as in *Fasciolaria*, and armed with a single denticle; while the lateral teeth are very large, not versatile, and shaped somewhat like the canine teeth of Mammals, pointing obliquely inward and backward, and hollow at the root or base of attachment.

* Proceedings Zoological Society, London, 1847, p. 153.

† See Kiener, Pleurot., p. 38; pl. xiii., f. 1.

‡ American Journal of Science and Arts, [2] xxxviii., p. 48.

§ This figure is said to be taken from the "Regne Animal" of Cuvier, Ed. 2d. May not some confusion have arisen between the ideas concerning the animal in question and the *Melanopsis buccinoidea*, in consequence of the similarity of specific names? We have not the "Regne Animal" at hand to refer to.

‖ Guide, I., p. 7, fig. 4.

This dentition is in some degree intermediate in character between the Odontoglossata of Gray and the Toxoglossata; and indicates a new group of value equivalent to these, which may be called Tomoglossata. Probably all of the Clavatulinæ, or Pleurotomidæ with an operculum having the nucleus on the inner edge, will be found to belong to it,

The relations of the genus *Halia*, the anatomy and dentition of which are described by Fischer in the "Journal de Conchyliologie," vol. VII., 1858, p. 141, will probably be found to lie with this group, rather than with the Defranciinæ. That animal has a true lingual ribbon, with the lateral teeth similar in position to those of *Clionella*, though much more slender. No rhachidian teeth have been observed.

Fam. DENTALIIDÆ.

HELONYX, nov. gen.

Type, H. CLAVATUS.—pl. 9, f. 14.

Dentalium clavatum Gould, Otia, p. 119.

Shell small, subulate, polished, almost hyaline, arcuated, swollen before the middle, and contracted at the mouth; posteriorly attenuated, with the margin of the anal aperture entire. Foot greatly elongated, cylindrical, and obtuse at the extremity; collar apparently entire. Anal siphon longer than in *Dentalium*. not fissured.

This genus comprises certain small *Dentalia*, which, from the contraction at the anterior extremity of their shells, have been commonly supposed to belong to Annelides allied to *Ditrupa*. An examination of the living animal in the typical and only living species, *D. clavatum*, discovered by the writer in the harbor of Hong Kong, China, has shown it to be a Mollusk, very closely allied to *Dentalium*. This species lives on muddy bottoms, at depths of from six to twenty fathoms. It was of a pure waxen-white color when alive, except where the dark-brown rami of the liver showed through the shell.

The genus, which first appears in the Cretaceous, is represented by several species in the various formations deposited during the Tertiary epoch, when it seems to have reached its climax of development.

The following are some of the fossil species, for information regarding which I am chiefly indebted to Mr. Meek.

H. PUSILLUS. *Dentalium* (*Ditrupa ?*) *pusillum* Gabb., Palæontology of California, I., 1864, p. 139; pl. xxi., f. 99.—Cretaceous formation of California.

H. SUBCOARCTATUS. *Ditrupa subcoarctata* Gabb., Jour. Acad. Nat. Sciences, Philadelphia, [2] IV., 1860, p. 386; pl. lxvii., f. 47.—Eocene of Wheelock, Texas.

H. COARCTATUS. *Dentalium coarctatum* Lamarck, An. sans. Vert., 2d edition, v., 1838, p. 599.—Miocene of Peidmont.

H. THALLUS. *Dentalium thallus* Conrad, Miocene Foss., 1844, p. 78, pl. xliv., f. 5.—Miocene of Virginia.